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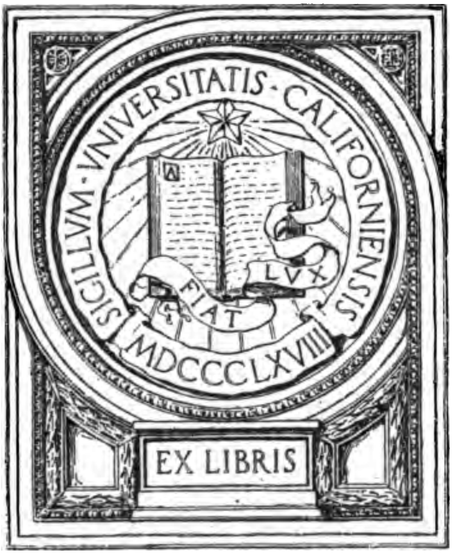
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INSTRUCTIONS FOR MOUNTING, USING, AND CARING FOR

BARBETTE CARRIAGE

MODEL OF 1892

FOR

12-INCH RIFLES

MODELS OF 1888, 1888 MI
AND 1888 MII

(*THREE PLATES*)

FEBRUARY 5, 1908

ORDNANCE DEPARTMENT U.S.A.

WASHINGTON
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LIST OF PLATES.

Plate No. — Drawing No.

I. Assembled views — 10–7–1A

II. Recoil brake — 10–7–8

III. Ammunition truck and tray — 10–7–19

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INSTRUCTIONS FOR MOUNTING, USING, AND CARING FOR BARBETTE CARRIAGE, MODEL OF 1892, FOR 12-INCH RIFLES, MODELS OF 1888, 1888 MI, AND 1888 MII.

(THREE PLATES.)

[The points in *italics* are of importance or concern the safety of the carriage and should be specially noted.]

GENERAL DESCRIPTION.

Principal Parts.—The carriage is of the center pintle form, designed for guns of models of 1888, 1888 MI, and 1888 MII, and consists of the following principal parts, viz, base ring resting upon the concrete platform, traversing-roller system, chassis and recoil rollers, top carriage, recoil and counter-recoil systems, traversing, elevating, and retracting mechanism, loading platform, projectile hoist, shot trays, and ammunition trucks.

Base Ring.—The base ring is of cast iron in one piece, secured to the platform by bolts through the flange. The lower roller path is on its upper surface.

The base ring is provided with leveling screws of bronze, bearing upon steel thrust plates set upon the concrete.

The pintle, rising from the center and forming part of the base ring, is a cylinder with a spiral oil groove on its outer surface.

An extension of the lower roller path is machined on its outer edge to form the traversing rack; on the underside of this extension the clips engage.

Traversing-Roller System.—Upon the lower roller path rests a circle of 24 forged-steel, live, conical traversing rollers, held in place by two concentric distance rings. The distance rings are secured to each other by 12 braces bolted between them and the system is held concentric with the pintle by flanges on the inner ends of the rollers.

The trunnions at each end of the traversing rollers run in bearings in the distance rings, these bearings being slotted through on the underside to permit assemblage.

Racer.—The racer is of cast steel. The upper roller path is on its under surface and rests upon the traversing-roller system. The racer also contains the pintle bearing, which fits over the base-ring pintle and is provided with a packed wrought-iron cover to keep out dust and water. On the top surface of the racer are the seats for the two chassis. Four cast-steel clips (two in front and two in rear) are bolted to the outer surface of the racer. These clips or guide hooks have lips which engage under a flange on the base ring. Between the clips is a dust guard which protects the traversing-roller system.

CHASSIS AND RECOIL ROLLERS.—The chassis of cast steel are bolted to the racer between the lugs which are cast on the upper surface of the racer.

In U-shaped recesses at the top of each chassis are placed nine recoil rollers, made of forged steel bushed with bronze and run on 3-inch journals of forged steel. These journals pass through both walls of the U-shaped recess in the chassis and are secured by being screwed into the inner wall.

The tops of the chassis rails are inclined 4 degrees upward and to the rear. At the forward ends of the chassis there are lugs projecting upward through which the piston rods pass.

Stops are placed on the chassis rails in front to limit the forward motion of the top carriage. The front surface of the projecting lugs is finished as a seat for a shield to protect the gunners.

TOP CARRIAGE.—The top carriage is made in one piece of cast steel. It consists of two side frames containing the beds for the trunnions of the gun and the recoil cylinders, united by a transom passing underneath the gun. The trunnion beds are bushed with bronze and each cap-square is dovetailed and secured by bolts. Grease cups attached to the upper end of the top carriage and connected to the trunnion-bed bushings by brass tubes, provide lubrication for the gun-trunnion bearings.

Flanges on the top carriages are clipped over corresponding flanges on the chassis rails.

RECOIL AND COUNTER RECOIL SYSTEMS.—The cylinders are 10.5 inches in interior diameter, fitted with piston rods 4 inches in diameter, having pistons screwed on and with a clearance of 0.01 of an inch all round. The rods are secured by nuts to the upright lugs on chassis.

The rear end of each cylinder is closed by a screwed cylinder head, which has in its front face a cylindrical cavity 5.31 inches deep with rounded bottom, in which the male part of the counter recoil buffer enters with a diametral clearance of 0.005 of an inch. When the gun returns to the firing position the liquid caught in the cavity can only escape through the small clearance, thus acting as a buffer to check the velocity at the end of the return into battery.

At the front end of the recoil cylinder there are the usual stuffing boxes with glands and followers.

To secure equal resistance and equal fluid pressure in the two cylinders, equalizing pipes connect the front or pressure end.

In this pipe is an empty coupling, but on account of the location at which the pipe enters the cylinder the system can only be partly emptied by the coupling.

Each cylinder is provided with one filling and one vent hole at its rear end and with a drain hole at its front end.

Bronze plugs are provided to be screwed into the cylinder in the place of the equalizing pipe, thus continuing the piece in action should the pipes be destroyed.

After recoiling, the gun returns to the firing position at once by the action of gravity, the slope of the chassis rails being sufficient to permit the top carriage to move forward on the rollers.

During the recoil the pistons remain stationary and the top carriage with its cylinders is drawn over them. Each piston is slotted through its opposite sides and two throttling bars lie in the slots and extend the whole length of each cylinder. Their sectional area is such that the orifices for the flow of the liquid vary with the position of the piston during recoil so as to attain the desired resistance in the cylinder.

In any hydraulic brake the resistance is greater as the velocity of the piston in the cylinder is greater and as the openings for the passage of the oil are less. The velocity of retarded recoil of the top carriage being variable and a constant resistance being desired, the orifices are usually varied in such a manner that the relation between the velocity and the area of the orifices is at all points such as to give a nearly constant resistance.

Uniform resistance to the motion of the top carriage is obtained, its motion retarded and finally stopped, and the energy of recoil taken up principally by the resistance which the oil in the cylinders offers while being forced from one side of the piston to the other through the following openings:

(*a*) The clearance between the walls of the cylinder and the piston, necessary for working movement. This opening is a constant area.

(*b*) The orifices between the throttling bars and their slots in the piston. These openings vary with the profile of the throttling bars, since the slots which are partially closed by these bars have a constant area.

The two throttling bars in each cylinder are constructed of constant width, with only a sufficient lateral clearance in the slots for working movement, and of varying depth, the profile being so designed that the area of the orifices (the portions of the slots not filled with the bars) for the escape of the oil past the piston increases from the beginning of motion up to the point where the velocity of retarded recoil of the top carriage is greatest; beyond this point the velocity of retarded recoil of the top carriage is continually decreasing and the area of the orifices decreases also until it becomes zero at the end of the recoil. The orifices have at each point of the recoil such a relation to the velocity of retarded recoil of the top carriage at that point as to give nearly a constant resistance to the motion of the top carriage. This results in nearly constant fluid pressure in the cylinder.

The areas of the orifices have to be calculated for a particular set of conditions of loading, and any variations in these conditions will change the length of recoil of the top carriage.

For all charges the cylinder should, before firing, be completely filled to the level of the filling hole.

A neutral oil, of specific gravity about 0.85 (such as the hydroline at present issued), is used, and about 41 gallons are required to fill the cylinder and pipes of one carriage.

TRAVERSING MECHANISM.—For pointing the carriage in azimuth two crank handles may be attached to the traversing shaft and manipulated by men standing on the concrete platform. These handles actuate a train of gears engaging the traversing rack, which is machined on the outer circumference of the base ring.

ELEVATING MECHANISM.—Pointing in elevation is obtained by a forged-steel rack bolted to the gun. A pinion mounted on a short cross shaft engages the rack. On the outer end of this shaft there is keyed a cup-shaped friction clamp fitting over a corresponding shaped hub located on the outside of a worm gear mounted on the elevating pinion shaft and brought to a bearing in its seat by a nut on the end of the shaft. By this arrangement excessive stress on the elevating mechanism is relieved during firing. This worm gear engages in a worm splined upon a vertical shaft, on the lower end of which is splined a bevel gear which engages with a second bevel gear upon the main elevating shaft, which runs parallel to the top surface of the right chassis rail. This second bevel gear slides upon the squared section of this shaft, being carried back and forth during the recoil of the top carriage. The front end of the main elevating shaft is connected with the elevating handwheels, one on each side of the carriage, by spiral gears and a through shaft.

ELEVATION INDICATOR.—To indicate the amount of elevation of the gun a toothed gear rack is bolted to the left trunnion. This actuates a toothed pinion carrying the elevation pointer. The pitch diameter of the gear rack and pinion are to each other as 5 to 1, thus the pointer moves through an angle five times as great as that which the gun moves through. This makes the graduations on the bronze arc larger in proportion. The arc is bolted to the top carriage through slotted holes so as to permit of adjustment. The least reading is two minutes.

The teeth of the rack are very accurately cut, and a spring is provided to take up back lash.

RETRACTING MECHANISM.—For the purpose of maneuvering, and in order to ascertain from time to time whether the recoiling parts are in working order, the retracting mechanism has been provided. It consists of two double blocks hooked to the front of the top carriage and two triple blocks hooked to the rear of the chassis.

A 3-inch manila rope runs through the blocks and the falls lead from the blocks to the retracting drums, which are keyed to the retracting drum shaft, one at each end thereof.

To retract the gun the end of each fall is held by a cannoneer, after several turns have been taken with it around the retracting drum, and the latter is revolved by means of the retracting crank handles and intermediate mechanism until the recoiling parts are drawn to the rear a distance of 48 inches, which is the length of recoil allowed.

The motion of the retracting drums is caused by a wormwheel. This engages with a worm with triple threads keyed to a horizontal worm shaft parallel to the chassis supported in bronze-bushed brackets bolted to the racer. At the opposite end of the shaft is a miter gear engaging with a miter gear on the horizontal crank shaft which extends through both chassis, being supported by bronze-bushed bearings in the chassis. There are two cranks for operating this shaft, one on each side of the carriage.

The carriage, after being retracted, must be allowed to run into battery gradually, by slacking the falls as evenly as possible on either side, since the barbette carriages are not provided with means for holding and tripping. *The blocks must be removed before firing.*

LOADING PLATFORM.—The loading platform consists of a steel plate supported at a convenient height for loading by frames of T iron. To prevent the gun from striking the platform in recoil the interior is cut out, except at the rear, and replaced by a sliding plate. This plate slides in guides bolted to the underside of the platform plate and is kept at the same distance from the breech of the gun by two connecting rods joining it to lugs on the top carriage. A rail of wrought-iron tubing supported by stanchions extends around the loading and sighting platforms. A set of steps bolted to the platform gives access to it on each side. Steps are fastened to each side of the racer to facilitate reaching the racer.

A sight bracket of bronze is bolted to the rear part of the right chassis for the attachment of a telescopic sight to give azimuth only.

A sighting platform is attached to the loading platform in convenient position for sighting.

Traversing stops, placed on each side of the base ring, and a stop attached to the left rear guide hook, limit the motion in azimuth in order to prevent the loading platform from striking the parapet.

Projectile Hoist, Shot Trays, and Ammunition Trucks.—At the rear of the left chassis a crane for raising the projectile to the gun is supported in lugs cast on the chassis. The fall of the hoisting tackle leads from the crane sheave over guide sheaves to a drum mounted on a short shaft passing through the left chassis. Motion is communicated to the drum by spur gears from a parallel short shaft carrying the hoisting crank. A pawl engaging in a ratchet wheel on the crank shaft holds the projectile at any height.

Seven shot tongs, one tray, and three ammunition trucks are provided with each carriage.

Miscellaneous.—There are plates on the carriage indicating the direction of motion of the cranks for elevating and traversing.

Drainage holes are drilled in all pockets, and all axles, trunnions, and sliding bearing surfaces are provided with oil holes having screw plugs.

In case of damage to the equalizing pipes, bronze plugs have been provided for permanently closing the cavities of the pipe connections.

The necessary tools and implements for each carriage are furnished packed in a chest marked with the number of the carriage.

ASSEMBLING THE CARRIAGE.

Implements.—The assembling requires machines and implements for mechanical maneuvers usually found at forts, but in addition to falls, blocking, jacks, sling chains, etc., shears or a derrick capable of lifting 14 tons will be found especially useful.

General Remarks.—The size of the carriage is such that it must be dismantled for shipment, so that when it arrives at its destination it has to be entirely assembled.

In assembling the carriage, as in all machinery, no parts should be directly struck with a steel hammer or sledge. Soft-metal drifts or copper or lead hammers should be used.

In unloading or handling the parts care should be exercised that the edges or finished surfaces do not become upset or burred. When two bearing surfaces are brought together, it is especially necessary that both parts should be absolutely clean, smooth, and well lubricated.

The following description gives a statement of the order in which the parts should be put together rather than complete enumeration of the details of the operations:

All machined parts, including all joints, keys, bolts, bolt holes, and working parts, should be thoroughly cleaned and oiled with some good lubricating oil before being assembled.

Base Ring.—The base ring can be lowered onto blocks over the platform by means of a derrick or moved on skids and rollers into position. When the holes in the base ring are directly over the corresponding bolts, lower by means of jacks until the ring rests on the platform with the bolts as nearly central as possible in the holes.

Leveling.—Eight bronze screws and eight steel thrust plates are provided for adjusting the level of the base ring. These serve to give the base ring proper support on the already well-set concrete and permit the grouting to become well set without deformation while the rest of the carriage is being assembled. *After the grouting under the base ring has thoroughly set, these screws should be unscrewed slightly to prevent their being overstrained in firing.*

A sensitive machinist's level and an accurate steel straightedge should be used in leveling all parts.

The threads of the platform bolts should be carefully examined to see that they have not been burred in the operation of lowering and to see that they are free from rust. After they have been put in good order, thoroughly oil the threads of both nuts and bolts before putting on the nuts. In screwing down the nuts on the platform bolts, take up on each a little at a time so that no part of the base ring will be strained. Great care should be taken in setting the base ring not to spring it.

In using the level it should always be reversed and the mean of the readings in the two positions considered the true reading. The leveling may be done from the top of the pintle surface, which is machine-finished for that purpose, but should be verified by placing the straightedge on the inside edge of the turned surface of the roller path, following around circumferentially each way on this surface, leveling and tightening the foundation bolts.

The greatest care must be taken in leveling and setting the base ring, as the proper working of the carriage depends on the accuracy of this work.

After the base ring is properly leveled, pour under it a grouting of neat Portland cement.

Distance Rings and Traversing Rollers.—Clean the lower roller path very thoroughly, after which place the rollers and distance rings in position and run them around several times by hand to see that they work freely. If there is any unreasonable bearing it must be remedied before proceeding any further.

Racer, Chassis, and Top Carriage.—The upper roller path, as well as the pintle surfaces on both racer and base ring, should be thoroughly cleaned and oiled, after which move the racer over the proper position by means of skids and rollers and then lower by means of jacks. The racer should be lowered carefully to prevent any binding of the pintle surfaces. When the racer is down on the rollers, move it around by hand to see that it moves freely. Thoroughly clean and oil all contact surfaces, bolts, keys, and bolt holes. Move the chassis rails to their positions and bolt them to the racer.

Before mounting the top carriage see that the recoil rollers are perfectly clean and that the pockets are free from sand. On account of the clips engaging over flanges on the chassis rails, the top carriage must be mounted from the rear. Raise it on blocking until it is high enough to engage and slide over the chassis rails. Move it forward on rollers, taking care to keep it at the same inclination as the chassis rails so that it will not bind. If the piston rods are assembled to the top carriage they may be pushed through the holes in the lugs on the front of the chassis and secured by the two piston-rod nuts. If they are not assembled they should be thoroughly cleaned and then inserted into the cylinder from the rear.

TRAVERSING MECHANISM.—Assemble to the lug on the front of the racer the traversing-rack pinion shaft with the traversing-spur gear at the upper end and the traversing-rack pinion at the lower end properly keyed on. Place the traversing bevel gear with the traversing spur pinion pinned to its hub on the vertical stud tapped in the racer. After placing the traversing bevel pinion in position insert the traversing crank shaft from the outside and put on the traversing cranks.

ELEVATING MECHANISM.—Assemble the elevating apparatus, beginning at the top with the parts on the top carriage, and place the shafts and gears in their proper places, putting in the miter gear which moves with the top carriage before the side shaft is assembled.

RETRACTING MECHANISM.—Bolt the retracting hooks in their respective places, if not already on the carriage, place the worm shaft, the wormwheel, and the retraction drum shaft brackets in position and assemble the drums, wormwheel shafts, worm, and gears in their proper places, being careful that the keys and headless screws are properly located.

PROJECTILE HOIST.—Assemble the projectile-hoist crank shaft with its drum and pawl. Mount the crane in its step and assemble its sheaves and hoisting tackle. Pass the end of the rope through a hole in the drum and fasten it on the inside.

LOADING PLATFORM AND OTHER PARTS.—Bolt the loading platform to the chassis and assemble all minor parts.

AFTER ASSEMBLING.—After the carriage is completely assembled, the gun mounted, and the cylinders are filled with oil, retract the top carriage and allow it to go into battery several times to see that everything works properly.

To Pack or Repack a Stuffing Box.—Examine the old packing and discard all unfit for use. If any of the old packing is used it should be put in after the new. See that the stuffing boxes are well cleaned and oiled.

Put on the piston rod one ring of 1-inch Garlock's "waterproof hydraulic" packing and force it well to the bottom of the stuffing box by a wooden stick and mallet. Treat each layer of packing in a similar manner, being careful to break joints until seven rings of new packing have been inserted, or an equal amount of new and old when any of the latter is used. Place the gland on the follower, enter them together in the box, and screw up the follower.

No more force should be used on the spanner wrench than that of two men, and generally that of one man is sufficient. The addition of the pipe to the end of the spanner wrench should not be permitted.

The follower should be tightened from time to time. If the follower is screwed into the stuffing box too tightly, an unnecessary amount of friction will be produced on the piston rod. When the follower is screwed in until the flange strikes the box another ring of packing should be inserted.

It is to be expected that a slight amount of oil will soak through and drip from boxes of carriages when not in use. Also when tightening the followers a slight amount of oil will squeeze out of the saturated packing. This oil should be caught in the drip pan and not allowed the render the carriage unsightly.

Removing Packing from Stuffing Boxes.—(Using new extractor furnished by the Ordnance Department.) Close the extractor around the piston rod and insert the locking pin. Turn the extractor to the left, with pressure on the packing, until the needles are firmly engaged in the packing. Draw the packing out, turning slowly to the left. In the case of a box with interior thread and if the ring is tight, it should be unscrewed and not stripped out by the thread, because unless unscrewed it would catch upon and be injured by the thread.

Extractor bars are provided to be used for starting the packing from its seat and by inserting the toes of the bars in the rack teeth and prying over the edge of the box, being careful not to injure the thread.

Filling Recoil Cylinders.—The top carriage should be "in battery." To fill the cylinders with oil, remove for this purpose the four plugs, two in each cylinder. The rear ones on each cylinder are the vent plugs and those directly in front of the vent plugs are the filling plugs. Pour clean neutral oil of specific gravity about 0.85

(such as the "hydroline" now issued to the service) into the filling hole in one cylinder until it flows out of the hole in the other. Allow any air that may be present to escape, then pour in more oil until the system is filled, and replace all plugs. About 41 gallons of oil are required.

INSTRUCTIONS FOR CLEANING RECOIL CYLINDERS.—Remove oil from cylinders and equalizing pipes.

Retract the gun until the pistons are in the middle of the cylinders; place hard-wood planks 1 inch thick betwen the front ends of the cylinders and the counter-recoil stops so as to positively retain the top carriage in this position. Care should be taken that both planks are of equal length.

Remove the cylinder heads and both piston-rod nuts and carefully withdraw the piston rods from the cylinders. Each part dismounted should be tagged to insure its being assembled in its correct place.

Thoroughly clean the cylinders with kerosene oil forced from a hand pump into both ends of each cylinder. The plug in the emptying coupling should be removed and both branches of the equalizing pipe flushed out from their cylinder ends. Then wipe the interior of the cylinders dry with clean cotton waste and clean the piston rods and cylinder heads.

Replace the emptying coupling plug, assemble the piston rods, nuts, and cylinder heads, exercising great care that none of the parts are burred or otherwise damaged. The cylinder heads should be firmly screwed into place, care being taken that the packing ring is in good condition and properly placed. Screw the followers tight against the packing in the stuffing boxes.

All parts dismounted should be carefully inspected to ascertain that they have been properly assembled. Retract the top carriage until both planks can be removed, then, by means of the retracting gear, allow the gun to return slowly into the firing position. After the cylinders have been filled with oil the gun should be retracted and allowed to run into battery several times to insure that all parts are in good working order.

SPECIAL POINTS TO BE NOTED.—After the carriage has been completely assembled and the gun mounted, note that—

1. All bearing surfaces are thoroughly cleaned and lubricated, including the pintle surfaces and the teeth of all gears.

2. The traversing rollers all bear.

3. The recoil rollers turn freely by hand and their recesses are clean.

4. All oil holes are clean and free from grit and properly closed with screw plugs.

5. There are no burrs on the chassis rails to interfere with the motion of the top carriage.

6. The teeth of all traversing, elevating, retracting, and projectile-hoist gears are in good condition.

7. The stuffing boxes of the recoil cylinders are properly packed.

8. The bolts through the walls of the recoil cylinders engaging the throttling bars are properly set up; also all filling plugs.

9. All pipe connections are properly set up and are tight.

10. The base ring of the carriage is level. This can be tested by traversing the carriage throughout its extent with a clinometer placed at the muzzle.

11. The name plate and direction plates are properly placed on the carriage.

12. The azimuth pointer remains in smooth contact with the azimuth circle while the carriage is traversed and all graduations are properly and neatly numbered.

13. The traversing rollers and paths are clean and free from rust.

14. The leveling screws of the carriage are in place and backed off so as not to bear on the thrust plates.

15. The elevation indicator is properly attached and correctly graduated.

16. The stops limit the motion in azimuth.

CARE OF THE CARRIAGE.—Carriages should be traversed from time to time throughout their entire allowed movement. The habitual position of guns on barbette carriages is "in battery," but at intervals the gun should be retracted and allowed to run again into battery, and should be elevated and depressed within the limits.

It is especially required that all parts of carriages be kept free from rust *at all times*. If this be allowed to accumulate its removal from all bearing parts, and especially piston rods, requires particular attention in order that clearances shall not be unduly increased. The use of sandpaper for this purpose is forbidden, and emery cloth No. 1, being coarse enough for any ordinary rusting, should be used, the rust being softened, if necessary, by kerosene.

SERVICE CONDITION (LUBRICATION, ETC.).—When the carriage is to be kept in readiness for service, and is in daily or frequent use, all bearing parts must be kept thoroughly cleaned and lubricated. Especial attention should be given to the lubricating of gun trunnions, rollers, pintle surfaces, shaft axle bearings, and sliding surfaces, and the elevating, traversing, hoisting, and retracting mechanisms, including the teeth of all gears.

The above parts should be lubricated at frequent intervals, whether the carriage is maneuvered or not, and it is essential for the proper preservation and working of the carriage that on every day on which it is to be maneuvered for any purpose all bearings should be well lubricated immediately before such maneuvering.

It will occasionally be necessary to examine all roller bearings to see that the dust guards are in proper place and that the rollers themselves are clean. If they be found dirty, they may be flushed with kerosene oil; but care must be taken to fill the bearings with synovial oil after the kerosene has drained away. If the rollers have rusted they must be taken out and cleaned.

RECOIL CYLINDERS.—Experience has indicated that the oil should not be removed from the recoil cylinders when carriages are to remain unused for a considerable period, as the walls of the cylinders soon become dry and then rust.

OIL HOLES.—Oil holes, where provided, must be cleaned out frequently to keep them free from sand and grit, and will habitually be kept closed by the screw plugs provided, except when in the act of oiling.

Before oiling at any oil hole, wipe off carefully any dirt or grit near the opening that might be carried down into the bearing by the oil.

COMPRESSION GREASE CUPS.—Where compression grease cups are provided, similar precautions against dirt or grit must be observed. In filling these cups fill only to the bottom of the bevel at the top of the cup; if too full, the leather packing will not act effectively. In putting on the cap see that the leather-packed follower enters the cup without being caught, cut, or bent by the edge of the cup. Screw the cap down on the cup until the spring rod projects about ¼ inch above the top of the cap. Later, when the spring has recovered and has moved the follower forward, forcing the grease through the tube into the bearings, which will be indicated by the spring rod being pulled into the cap until its nut touches or nearly touches the cap, it will again be necessary to screw up the cap on the cup until the spring is again compressed. When the cap is screwed nearly home and the spring rod does not project, it is an indication that the cup should be refilled.

For further information regarding paints, oils, cleaning materials, and methods of using same see Ordnance Department Pamphlet, Form 1869. Annual allowances will also be found in this pamphlet.

LIST OF ARTICLES PACKED IN ARMAMENT CHEST FOR 12-INCH RIFLE, MODELS OF 1888, 1888 MI AND 1888 MII, AND BARBETTE CARRIAGE, MODEL OF 1892.

[Articles marked * are carried loose in chest.]

For rifle.

1 bar screw driver for breech plate screws.
3 bar screw drivers for breech mechanism screws.
1 tool for unscrewing housing of crank catch.
1 obturator nut wrench.
1 obturator nut clamp screw wrench.
1 pin punch.
1 tit wrench for obturator.
2 bronze drifts.
1 pressure plug wrench.
1 ring for lifting breech plate.
1 gunner's punch.
1 gunner's drill.
* 1 gunner's pouch.
* 1 pair gunner's sleeves.
* 1 gunner's lanyard.
1 metal scraper.
* 10 pounds cotton waste.
* 4 balls twine, assorted.
* 2 pounds copper wire, No. 12.
* 2 pounds copper wire, No. 16.
1 quire emery cloth, No. 00.
* 3 wagon sponges.
1 file, flat, dead smooth, 8-inch.
1 file, round, second cut, 8-inch.
1 file, half-round, smooth, 8-inch.
1 file, three-cornered, 8-inch.
1 copper hammer.
1 boiler-maker's hammer.
1 hand mallet.
* 1 long handled mallet.
1 pair cutting pliers, 7-inch.
1 extension pipe handle.
* 1 box containing firing mechanism.
In firing mechanism box:
    1 cleaning reamer for primer seat.
    3 cleaning brushes for primer seat.
1 monkey wrench, 18-inch.
1 monkey wrench, 12-inch.
3 files, pillar, No. 6, 6-inch.
For use on bruised breechblocks, no other files to be used thereon:
    3 files, three-cornered, No. 4, 6-inch.
    3 files, half-round, smooth, 8-inch.
    3 files, round, smooth, 8-inch.

For carriage.

1 box wrench for friction clamp nut.
1 box wrench for elevating rack.
1 wrench for stuffing box gland.
1 wrench for scroll spring.
1 screw-driver for journals for recoil rollers.
1 screw-driver, commercial.
1 screw-driver for elevating rack.
1 screw-driver for dust guard.
2 screw eyes for extracting followers in stuffing box.
1 double wrench for loading platform and throttling bars.
1 double wrench for elevating apparatus.
1 double wrench, 0.5 and 0.625 inch nuts.
1 single wrench for 1-inch nuts.
1 single wrench for 1.125-inch nuts.
1 single wrench for 1.75-inch nuts.
1 single wrench for 2-inch nuts.
* 1 oiler, locomotive, 1-quart.
2 oilers, half-pint.
* 1 crane block and rope.

NOTE.—The following articles being too large are not to be kept in chest:

1 box wrench for guide hooks.
1 box wrench for rear cylinder head.
2 wrenches for piston rod nuts.
2 retracting ropes with two blocks each.
2 water buckets, indurated fiber.

List of Implements furnished with 12-inch Rifle, Models of 1888 Mi and 1888 Mii.

- 1 rammer and staff.
- 1 sponge and staff, bore.
- 1 sponge and staff, chamber.
- 1 breech cover.
- 1 slush brush with handles to connect with special sponge staff.
- 1 steel scraper and socket to fit special sponge staff.
- 1 special sponge staff for slush brush and steel scraper.

List of Equipment supplied for 12-inch Rifle, Models of 1888 Mi and 1888 Mii, and Barbette Carriage, Model of 1892.

- 2 paint pots, 1 gallon.
- 1 sieve for paints and oils.
- 2 brushes, wall, 4-inch (expendable).
- 3 sash tools, No. 6 (expendable).
- 3 brushes, paint, 6/0 (expendable).
- 2 dusters, painter's No. 2 (expendable).

Gaskets and packing:
- 1 set gaskets for carriage.
- 14 rings Garlock's waterproof hydraulic packing, 1 inch square and 4 inches inside diameter.

Weights of Principal Parts, Carriages Nos. 1 to 4.

Name of part.	Number of pieces.	Weight.
Top carriage	1	15,570
Chassis	2	24,250
Racer	1	17,200
Traversing worm bearing	1	110
Dust guard	1	295
Pintle cover	1	112
Base ring	1	34,120
Azimuth circle	1	28
Distance rings	2	930
Traversing rollers	24	3,432
Separators	12	144
Elevating mechanism:		
Rack	1	180
Pinion	1	17
Pinion shaft	1	35
Worm wheel	1	91
Worm	1	30
Worm shaft	1	42
Miters	2	30
Miter shaft	1	125
Spiral wheels	2	92
Spiral wheel shaft	1	150
Hand wheels	2	140
Friction clamp	1	16
Stuffing boxes	2	440
Rear cylinder heads	2	432
Throttling bars	4	160
Piston rods and heads	2	878
Piston rod nuts	4	50
Recoil rollers	18	4,716
Roller journals	18	504
Clips	4	1,304
Buffer brackets	2	282
Buffers (complete)	2	228
Traversing mechanism:		
Pinion	1	141
Pinion shaft	1	90
Worm wheel	1	360
Worm	1	58
Worm shaft	1	143
Cranks	2	42
Projectile hoist:		
Crane	1	425
Block	1	24
Drum	1	122
Drum shaft	1	24
Pinion	1	26
Pinion shaft	1	23
Crank	1	21
Loading platform (complete)	1	2,995
Sliding platform (with connection)	1	636
Elevation indicator (complete)	1	30
Bolts, nuts		1,507
Total	137	112,900

Names of parts of the 12-inch barbette carriage, model of 1892, their location, general dimensions, and material of which they are made.

Name of parts.	Location.	Material.	Number.	Diameter.	Length.	Nuts.	Remarks.
				Inches.	*Inches.*		
Azimuth circle	On base ring (lower roller path)	Brass	1				In six sections.
Azimuth pointer (index plate)	On azimuth-pointer bracket	do	1				With two 0.125-inch dowels.
Azimuth-pointer bracket	Bolted to clip	Wrought iron	1				
Ball-bearing balls	Between washers	Steel, hardened	92	0.25			
Ball-bearing cover	Over ball-bearing washer	Brass	2				
Ball-bearing washer	Elevating worm shaft	Steel, hardened	4				Top and bottom part.
Base ring (lower roller path)	On platform	Gun iron	1				
Bearing for elevating shaft	Bolted to top carriage	Cast steel	1				
Bolts, countersunk head	Guide for sliding plate to platform	Wrought iron	20	.75	2.875	20	
Do	Platform plate to cheeks	do	20	.75	1.875	20	
Bolts, hexagonal head	Bearing for elevating shaft to top carriage.	Steel	5	1.25	3		Tap bolt.
Do	Bearing for traversing pinion to racer	do	4	1	2		Do.
Do	Bracket for azimuth-pointer to clip	Wrought iron	2	.5	1.25		Do.
Do	Bracket for sliding-plate connection to top carriage.	do	4	1.25	2.75		Do.
Do	do	Steel	4	1.5	3.5		Do.
Do	Buffer bracket to chasis	do	1	2	5		Do.
Do	Chassis to racer	do	36	1.75	6.625	36	Carriages after No. 4.
Do	do	do	8	1.75	4.5		Tap bolt. Carriages after No. 4.
Do	do	do	36	1.75	7.875	36	Carriages Nos. 1 to 4, inclusive.
Do	do	do	8	1.75	5.75		Tap bolt. Carriages Nos. 1 to 4, inclusive.
Do	Cheeks to chassis	do	4	1	2.25		Tap bolt. Carriages after No. 4.
Do	do	do	8	.875	2.125		Do.
Do	Cheeks to extension (loading platform).	do	4	.875	1.625		Tap bolt. Carriages Nos. 1 to 4, inclusive.
Do	do	do	32	.75	1.5		Do.
Do	do	do	4	1.25	3.875	4	Do.
Do	Clip (guide hook) to racer	do	20	2	5.5		Tap bolt. 2.75 inches across flats.
Do	Crane bracket to cheek	do	3	1.5	5		Tap bolt. Carriages Nos. 1 to 4, inclusive.
Do	Elevating rack to gun	do	2	1.25	4.75		Tap bolt.
Do	Extension to chassis (loading platform).	do	16	.75	2		Tap bolt. Carriages after No. 4.
Do	do	do	4	.875	2.125		Tap bolt. Carriages Nos. 1 to 4, inclusive.
Do	do	do	28	.75	2		Do.
Do	do	do	4	.75	2.875	4	Carriages Nos. 1 to 4, inclusive. Standing bolts.
Do	do	do	8	1.125	3.375		Tap bolt. Carriages Nos. 1 to 4, inclusive.
Do	Emptying coupling to top carriage	do	2	.75	1.5		Tap bolt.
Do	Pintle cover to racer	Wrought iron	12	.625	.9375		Do.

Names of parts of the 12-inch barbette carriage, model of 1892, their location, general dimensions, and material of which they are made—Continued.

Name of part.	Location.	Material.	Number.	Diameter.	Length.	Nuts.	Remarks.
				Inches.	*Inches.*		
Bolts, hexagonal head	Bracket for platform plate to cheek	Steel	8	0.625	2.75	8	Carriages after No. 4.
Do	do	do	16	.75	2.75	16	Do.
Do	Platform for trunnion sight to racer	Wrought iron	4	.625	.875		Tap bolt.
Do	Racer steps to racer	Steel	8	1	1.5		Do.
Do	Railing to platform	Wrought iron	52	.625	1.125		Do.
Do	Retraction hook to top carriage	Steel	2	1.25	3		Do.
Do	do	do	2	1	3		Do.
Do	Retraction shaft and worm brackets	do	8	1	3		Do.
Do	Retraction worm-shaft bracket	do	2	1	2.75		Do.
Do	Retraction worm wheel	do	6	.75	1.5		Do.
Do	Sighting handle to top carriage	do	8	1	2		Do.
Do	Standard for chassis sight, right chassis.	Wrought iron	4	.75	1.75		Do.
Do	Throttling bars to cylinder	Steel	36	.75	3.125		Tap bolt, copper washer.
Do	Trunnion cap to top carriage	do	4	1.5	4.25		Tap bolt.
Do	Washer to traversing shaft	do	1	.75	1.75		Do.
Do	Worm-wheel bracket cover	do	8	.375	.75		Do.
Bolts, round head	Braces to roller frame (distance rings)	do	12	1	16.75	12	Smooth forgings.
Do	Elevating rack to gun	do	2	1.25	[a] 3.375		Tap bolt.
Do	Traversing stop to clip (guide hook)	do	2	1.25	2.5		Do.
Bolts, square head	Buffer bracket to chassis	do	3	2	7.125	3	
Do	Bracket for platform plate checks	Wrought iron	16	.75	2		Carriages after No. 4.
Do	End braces to platform	do	8	.625			
Do	do	do	4	.625			
Do	Platform plate to cheeks	do	8	.625			
Do	do	do	18	.625			
Do	Step braces to platform	do	8				
Do	do	do	8				
Braces	Between inner and outer distance rings.	Cast iron	12				
Brackets for chassis sight	Bolted to right chassis	Bronze	1				
Bracket for platform plate	Bolted to platform plate and cheeks	Cast iron	4				Do.
Bracket for retracting drum-shaft	Bolted to racer	do	1				
Bracket for retracting worm-wheel	do	do	1				
Bracket for retracting worm-shaft	do	do	1				
Bracket for traversing crank-shaft	do	Cast steel	1				
Buffer, counter-recoil (female)	On rear cylinder head	Bronze	2				
Buffer, counter-recoil (male)	Screwed into piston rod	Forged steel	2				
Buffer brackets	Bolted to chassis	Cast steel, No. 2	2				
Do	Bolted to buffer bracket	Forged steel	2				Rubber cylinder 6 inches in diameter and 4 inches long; 4 nuts.
Bushings	Chassis	Bronze	3				
Do	Elevating handwheel shaft	do	2				8 countersunk screws.

Do.	Recoil rollers	do.	18				
Do.	Retraction crank shaft	do.	2				
Do.	Traversing crank shaft	do.	2				Do.
Do.	Trunnion bed top carriages	do.	2				
Chassis	Bolted to racer	Cast steel, No. 1	2				Right and left.
Cheek plate	Bolted to cheek extension	Steel	2				Carriages Nos. 1 to 4, inclusive.
Cheek extension	Bolted to chassis	Gun iron	2				Carriages Nos. 1 to 4, inclusive; 1 right and left.
Cheek plate	do.	Steel	2				Carriages after No. 4.
Clip (guide hook)	Bolted to racer	Cast steel, No. 1	4				
Collar	Elevating worm shaft	Steel	1				Taper pin.
Do.	Retraction worm shaft	do.	1				Set screw.
Do.	Retraction crank shaft	do.	1				Do.
Connecting rod	Sliding plate to top carriage	Wrought iron	2				4 pins.
Connecting-rod bracket	Bolted to top carriage	do.	2				Right and left 2.5-inch set screws.
Crane bracket	Bolted to left chassis	Forged steel	1				Carriages Nos. 1 to 4, inclusive.
Crane-block sheave	Between housings	Bronze	2				
Crane-block journal	Through housing and sheaves	Wrought iron	1				Split pin.
Crane-block hook	On crane-block housing	do.	1				Nut and pin.
Crane-block weight	Forms casing for sheaves	do.	1				Carriages after No. 4 have a guide.
Crane crank	On crank shaft	do.	1				Wooden handle, nut, etc.
Crane-crank shaft	Through cheek extension (left)	Forged steel	1				Through chassis (left). Carriages after No. 4.
Crane drum	On drum shaft	Bronze	1				
Crane-drum gear	On drum	do.	1				44 teeth, 1-inch pitch.
Crane-drum pinion	On crane crank shaft	do.	1				15 teeth, 1-inch pitch.
Crane-drum shaft	Through cheek extension (left)	Forged steel	1				Through chassis (left). Carriages after No. 4.
Crane-guide sheave bracket	On crane mast	Wrought iron	2				
Crane-guide sheave	In guide sheave bracket	Bronze	2				
Crane-guide sheave journal	Through bracket and sheave	Wrought iron	2				0.187 ($\frac{3}{16}$)-inch split pin.
Crane mast	Rear of left chassis	do.	1				Carriages Nos. 1 to 4, inclusive; stop bolt and screw eye.
Crane-ratchet pawl	On cheek extension	do.	1				Screw eye, chain, and pin. Carriages after No. 4 on chassis.
Crane-ratchet wheel	On crank shaft	Bronze	1				Key.
Crane rope	For crane	Manila	1				72 feet 2-inch rope.
Crane sheave	In housing on crane mast	Bronze	2				
Crane-mast journal	Through housing and sheaves	Wrought iron	1				0.25-inch split pin.
Rear cylinder head	Screwed into rear of recoil cylinder	Cast steel	2				Fiber gasket, between head and cylinder.
Direction plate (elevate and depress)	On chassis	Bronze	2				6 screws.
Direction plate (right and left)	do.	do.	2				Do.
Distance ring	Traversing rollers (inner)	Wrought iron	1				
Do.	Traversing rollers (outer)	do.	1				
Dust guard	Bolted to racer	Sheet steel	1				
Elevating handwheel	Elevating handwheel shaft	Bronze	2				
Elevating handwheel shaft	Through front of chassis	Forged steel	1				0.437 ($\frac{7}{16}$) by 0.625 inch key, 2 washers and 2 nuts.
Elevating miter gear	On elevating side and worm shafts	Bronze and steel	2				0.437 ($\frac{7}{16}$) by 0.625 inch key, 2 tap pins, 1 collar, 12 teeth, 1.5 inch pitch.

[a] Over all.

Names of parts of the 12-inch barbette carriage, model of 1892, their location, general dimensions, and material of which they are made—Continued.

Name of part.	Location.	Material.	Number.	Diameter.	Length.	Nuts.	Remarks.
				Inches.	*Inches.*		
Elevating miter gear collar	On miter gear	Bronze	1				Taper pin.
Elevating pinion	On worm-wheel shaft	Forged steel	1				10 teeth, 2 inches pitch, 0.437 ($\frac{7}{16}$) by 0. 625 inch key.
Elevating rack	Bolted to gun	do	1				17 teeth, 2 inches pitch.
Elevating side shaft	Outside of right chassis	do	1				0.437 ($\frac{7}{16}$) by 0.625 inch key, 2 washers, 4 nuts.
Elevating spiral wheel	On elevating side and handwheel shafts.	One bronze and one iron.	2				23 teeth, 1½ inches pitch (actual), 0.437 ($\frac{7}{16}$) by 0.625 inch keys.
Elevating worm	On elevating worm wheel	Forged steel	1		6		1.5 inches pitch, left hand, 6.81 inches over all, 4.75 inches to top of thread.
Elevating worm shaft	Through vertical bearings on top carriage.	do	1				2 0.437 ($\frac{7}{16}$) by 0.625 inch keys, collar, pin, and nut.
Elevating worm wheel	On elevating worm-wheel shaft	Bronze	1				33 teeth, 1.5 inches pitch.
Elevating worm-wheel shaft	Through horizontal bearings on top carriage.	Forged steel	1				0.437 ($\frac{7}{16}$) by 0.625 inch key and nut.
Elevation-indicator arc	Bolted to top carriage	Bronze	1				
Elevation-indicator pinion	Studded to top carriage cap	do	1				18 teeth, 0.5-inch pitch.
Elevation-indicator pointer	On elevation-indicator stud	do	1				
Elevation-indicator scroll spring	Attached to elevation-indicator pointer.	Spring steel	1				Pin and lug.
Elevation-indicator stud	Top carriage cap	Steel	1				Key, washer, and nut.
Elevation-indicator wheel rack	Bolted to trunnion of gun	Bronze	1				90 teeth (in circumference), 0.5 inch pitch.
Elevation stop	Bolted to top carriage	Forged steel	1				With nut.
Emptying coupling	To top carriage	Steel	1				
End brace	On loading platform	do	1				
Equalizing pipe	On top carriage	Copper	1				Steel washer and fiber packing.
Equalizing-pipe nipple	Screwed into top carriage cylinders	Steel	2				
Equalizing-pipe union	Connects pipe and nipple	Bronze	2				
Extractor (screw eye)	For gland	Wrought iron	2				
Friction clamp	On worm-wheel shaft	Forged steel	1				
Guide hook (clip)	Bolted to racer	Cast steel, No. 1	4				
Guide for sliding plate	Bolted to loading platform	Bronze	2				
Index plate (azimuth pointer)	On index plate bracket	Brass	1				2 0.125-inch dowels.
Implement box	One with each carriage	Ash	1				
Loading platform	Bolted to cheek extension	Steel	1				Carriages after No. 4 bolted to rear of chassis.
Name plate	On right chassis	Bronze	1				
Oil cans	In implement box	Brass	3				2½-pint, 1-quart, with valve.
Oil plugs	For all oil holes	do					
Pintle cover	Racer (upper roller path)	Wrought iron	1	47			
Piston head	Screwed on piston rod	Forged steel	2				
Piston-head cover	Covers piston head	Bronze	2				
Piston rod	In recoil cylinders	Forged steel	2				
Piston-rod nuts	On piston rod	Steel	4				

Platform for chassis sight	Riveted to loading platform	Sheet steel	1				
Platform chains, hooks and eyes	Platform railing	Steel	2				
Plugs for filling and drainholes	On top carriage	do	6	1.25	1.5		Copper washers.
Racer (upper roller path)	On traverse rollers	Cast steel	1				
Railing	On loading platform	Wrought iron	1				
Retaining catch	Crane crank to shaft	Spring steel	1				
Do	Traversing and retracting crank to shaft.	do	1				
Retraction-block sheeks	Forms housing for sheaves	Steel	14				
Retraction-block clevis	On retraction block	do	6				
Retracting-block pins	Through clevis and separators	do	8				With nuts.
Retraction-block separators	Between cheeks	do	10				
Retraction-block sheave	In retraction block	Bronze, No. 3	10				
Retraction-block sheave journal	Through sheaves	Steel	4				Do.
Retraction-crank shaft	Through chassis	do	1				0.5-inch square key, collar and set screw.
Retraction drum	On retraction-drum shaft	Bronze	2				
Retraction-drum shaft	Through chassis	Steel	1				2 0.5-inch square keys and 2 0.75-inch spline screws.
Retraction hooks	Bolted to chassis and top carriage	Cast steel, No. 2	2				
Retraction-miter gear	On retraction crank and worm shafts	Steel	2				24 teeth, 4 per inch (0.785-inch pitch), 0.5-inch square keys, and 0.625-inch set screws.
Retraction worm	On worm shaft	Steel, No. 3	1		7		0.3-inch square key, triple R. H. thread, 2-inch lead, 2.72-inch P. D.
Retraction-worm shaft	Outside of left chassis	do	1				2 keys, collar, and set screws.
Retraction-worm wheel	On worm-wheel shaft	Bronze	1				72 teeth, 15.28-inch P. D., triple R. H. worm, 0.667-inch pitch.
Roller path, upper (racer)	On traverse rollers	Cast steel	1				
Roller path, lower (base ring)	On platform	Gun iron	1				
Rollers, recoil	In pockets on chassis	Forged steel	18				
Rollers, recoil journals	Through recoil rollers	do	18				
Rollers, traversing	On base ring	do	24				
Screws, countersunk	Azimuth (training) circle	Brass	48	.25	[a].375		
Do	Bushing for elevating-crank shaft	Steel	8	.5	[a]1.25		
Do	Bushing for traversing-crank shaft	do	8	.5	[a]1.25		
Do	Bushing for trunnion bed	Bronze	8	.75	[a]1.375		
Do	Filling piece dust guard to racer	do	33	1	[a]3.5		Carriages Nos. 1 to 4, inclusive.
Do	do	do	17	1	[a]3.5		Carriages after No. 4.
Do	Guides sliding plate to platform	do	22	.312($\frac{5}{16}$)	.75		
Do	Lining lateral bearing top carriage	Tobin bronze	100	.312($\frac{5}{16}$)	.937$\frac{15}{16}$		
Do	Piston cover	Brass	32	.312($\frac{5}{16}$)	[a].875		
Do	Retaining catch to crane crank	Steel	2	.31	[a].625		
Do	Retaining catch to traversing and retracting crank.	do	1	.31	[a].625		
Do	Stop to chassis	Wrought iron	6	.75	[a]1.5		
Do	Traversing bevel gear cover	Steel	4	.5	[a].75		
Screws, headless	Retraction drum	do	2	.75	1		
Do	Retraction miter gear and shaft collar.	do	3	.625	.875		

[a] Over all.

Name of parts of the 12-inch barbette carriage, model 1892, their location, general dimensions and material of which they are made—Continued.

Name of part.	Location.	Material.	Number.	Diameter.	Length.	Nuts.	Remarks.
				Inches.	*Inches.*		
Screws, headless	Retraction-worm shaft collar	Steel	1	.5	.75		
Do	Traversing bevel gear to racer	do	1	.5	1		
Screws, hexagonal	Sliding platform connection	do	4	0.5	1.25		Set screws.
Do	Leveling screws in base ring	Bronze, No. 3	8	2.25	5		
Screws, round-head	Azimuth pointer (index plate)	Brass	2	.375	.7		
Do	Dust guard to racer	Steel	60	.375	1		
Screw driver	For dust guard	Wrought iron	1				
Do	For elevating rack	Forged steel	1				
Do	For recoil roller journals	Wrought iron	1				
Do	For general use	Steel, hardened	1				With wooden handle.
Sighting handles	Bolted to top carriage	Wrought iron	2				
Sighting platform	Bolted to racer	do	1				
Sliding plate	On loading platform	Steel	1				
Sliding-plate connection	Bolted to sliding plate	Wrought iron	2				
Steps to loading platform	On each side of loading platform	Steel	2 sets.				
Steps to racer	On each side of racer	do	2 sets.				
Stop	On chassis	do	2				Carriages after No. 4.
Stuffing box	Screws into front end of cylinder	Bronze	2				Fiber gasket between box and cylinder.
Stuffing-box follower	In stuffing box	do	2				
Stuffing-box gland	do	do	2				Garlock's packing rings, 1 inch square, to be used.
Throttling bar	In recoil cylinders	Forged steel	4				
Thrust plates	On platform under base ring	Steel	8				
Top carriage	On recoil rollers	Cast steel, No. 2	1				
Top carriage caps	On top carriage	do	2				
Training (azimuth circle)	On base ring	Brass	1				
Traversing bevel gear	Studded to racer	Bronze	1				66 teeth, $1\frac{3}{8}$ inches pitch.
Traversing bevel pinion	Traversing-crank shaft	Forged steel	1				11 teeth, $1\frac{3}{8}$ inches pitch.
Traversing crank	do	do	2				Handle with brass sleeve and nut.
Traversing-crank shaft	Through chassis	do	1				0.375 by 0.437($\frac{7}{16}$) inch key.
Traversing-rack pinion	On traversing-crank shaft	Bronze	1				16 teeth, 2.5 inches pitch, 0.6 by 0.75-inch key.
Traversing-rack pinion shaft	Through bearing on front of racer	Forged steel	1				20.6 by 0.75 inch keys and nut.
Traversing-spur gear	On traversing-rack pinion shaft	Bronze	1				45 teeth, 1.875 inches pitch.
Traversing-spur pinion	On bevel gear	Forged steel	1				11 teeth, 1.875 inches pitch, 3 0.5-inch pins.
Traversing stop	On clip (guide hook)	Steel	1				
Traversing-stop pins	In racer	do	2	2	[a] 3.4		
Washers	For crane-crank shaft	do	1				
Do	For elevating hand-wheel shaft	do	2				
Do	For elevating side shaft	do	2				
Do	For traversing shaft	Cast iron	1				
Wheel	Hand wheel for elevating apparatus	Bronze	2				
Wire rope fastening	Crane drum	Forged steel	1			2	
Worm-wheel bracket cover	On reaction worm-wheel bracket	Steel	1				

Wrench	For stuffing-box gland	Forged steel	1				
Do	For piston-rod nuts	Steel	2				
Wrench, box	For cylinder head	Forged steel	1				
Do	For friction clamp	do	1				
Do	For guide hook (clip)	Wrought iron	1				
Do	For elevating rack	do	1				
Wrench, double	For 0.5 and 0.625-inch nuts	Steel	1				
Do	For loading platform and throttling bar.	Forged steel	1				
Do	For elevating apparatus	do	1				
Wrench, single	For 1-inch nuts	Steel	1				
Do	For 1.125-inch nuts	do	1				
Do	For 1.75-inch nuts	do	1				
Do	For 2-inch nuts	do	1				
Do	For scroll spring	do	1				

Ammunition truck.

Axle	For ammunition truck	Forged steel	1				
Cartridge pan	On support	Steel	2				
Caster	In caster bracket	Cast steel	1				
Caster bracket	Riveted to truck frame	Bronze	1				
Caster wheel	In caster	Cast steel	1				
Caster-wheel journal	Through caster and wheel	Forged steel	1				Split pins.
Collar	Pinned to caster	do	1				Taper pin.
Do	On axle	do	1				2 taper pins.
Frame	For truck	Steel	1				Riveted together.
Framing collar	Riveted to truck frame	Forged steel	2				2 taper pins.
Handle	Rear of top frame	Ash	1				2 pins riveted at both ends.
Oil plugs	For all oil holes	Brass					
Roller bearings	On axle	Steel and brass	2				With felt packing.
Do	Caster-wheel journal	do	1				Do.
Shot tray	Riveted to frame	Steel plate	[b] 2				
Support	do	Steel	2				
Washer	On hub of caster wheel	Bronze	2				
Do	On hub of truck wheel	do	4				
Wheels (truck)	On axle	Cast steel	2				

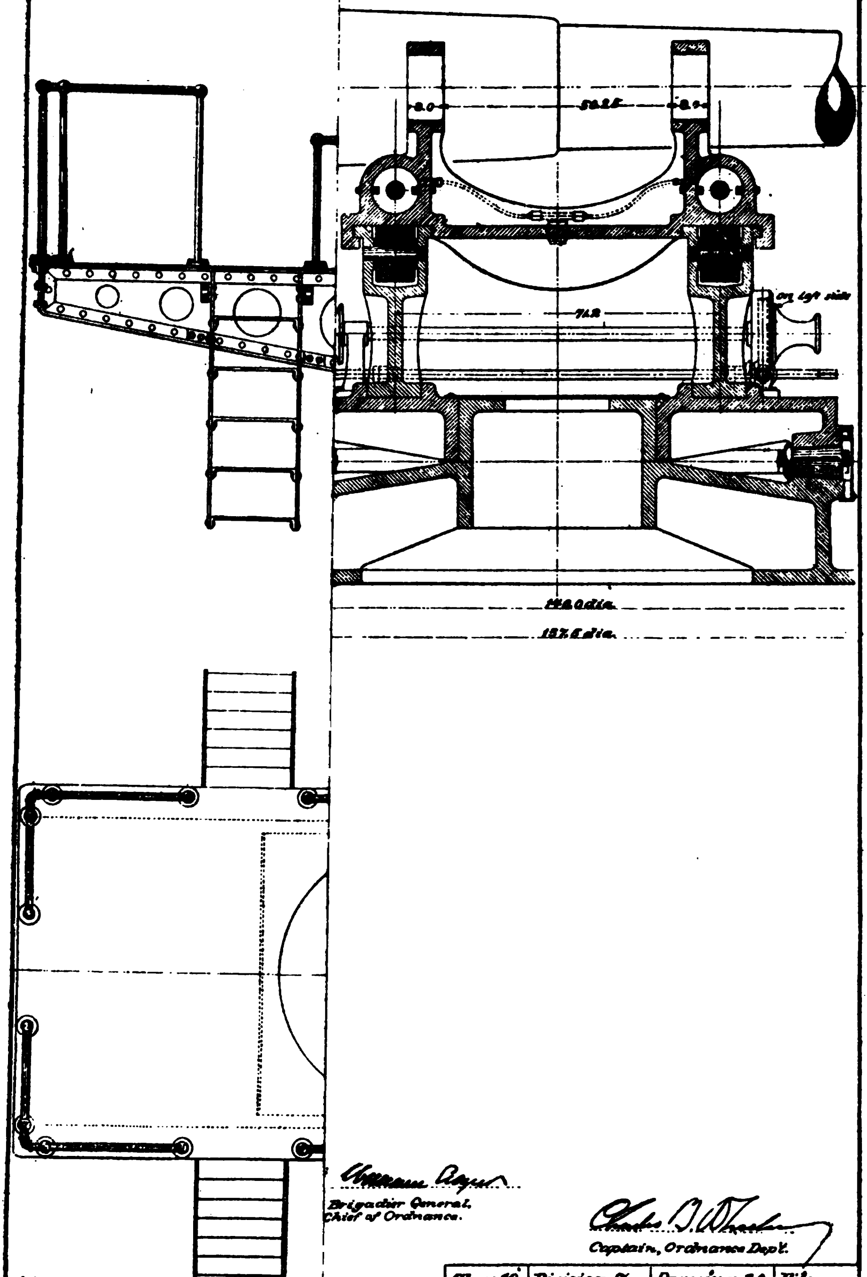
[a] Over all.

[b] Two pieces.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ORDNANCE,
Washington, February 5, 1908.

Form No. 1702.
Ed. Aug. 25-17—500.

PLATE I.



William Crozier
Brigadier General,
Chief of Ordnance.

Charles B. Wheeler
Captain, Ordnance Dep't.

L.S.B. Office of the Chief of Ordnance, U.S.A. 23rd 1904.

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